REMARKS

It is noted that the certified copy and the claim of priority under 35 USC 119 have been placed of record.

The election of claims 1-14 is confirmed. Applicants point out that there is no law, rule, or regulation saying that a method and apparatus have to be separated. Attached is a photocopy of MPEP 608.01(n) which says that claims of one statutory class many depend upon claims of another statutory class. IN 1894, (Oval Wood Dish Co. v. Sandy Creek Wood Mfg. Co., 1894 CD 216) claims were allowed on a wooden dish (apparatus) described by the method which wood is scooped out of a wooden block. In re Bridgeford 149 USPQ 55 said that a claim is not to be refused because of limitation of the English language.

Hence, the restriction requirement should be withdrawn.

The Examiner is respectfully requested to withdraw the requirement that each of the drawings 2A-E, etc. be set forth separately in the Brief Description of the Drawings. The descriptions of these figures are the same. The differences between the figures is the Ag, Cu, etc. content of the formula. In each case there would be almost a word for word description of the individual figures which would only enhance the cost to applicant, the Patent and Trademark Office and ultimately the taxpayer.

The 35 USC 112 Rejection

The unit of the copper resolution rate set forth on page 12, line 14 and in Table 1 on page

13 of the specification is "μm/sec".

On the other hand, in claims 3 and 11, the unit of the cooper resolution rate is set forth as "μm".

Therefore, claims 3 and 11 have been amended to make this correction. The rejection under 35 USC 112 is overcome by the foregoing amendments.

The 35 USC 112 Rejection

As claimed in claims 1 to 6 the invention is different from the references cited by the Examiner in the following ways:

JP9-94688

(1) JP9-94688 has the following claims:

Claim 1. A Pb-free solder consisting essentially of:

7 to 10 wt% of Zn;

0.01 to 1 wt% of Ni; and

a balance of Sn.

Claim 2. A Pb-free solder consisting essentially of:

7 to 10 wt% of Zn;

0.01 to 1 wt% of Ni;

0.5 to 3 wt% of Ag; and

a balance of Sn.

Claim 3. A Pb-free solder consisting essentially of:

7 to 10 wt% of Zn;

0.01 to 1 wt% of Ni;

0.1 to 3 wt% of Cu; and

a balance of Sn.

Claim 4. A Pb-free solder consisting essentially of:

7 to 10 wt% of Zn;

0.01 to 1 wt% of Ni;

0.5 to 3 wt% of Ag;

0.1 to 3 wt% of Cu; and

a balance of Sn.

Claim 5. A Pb-free solder according to one of the claims 1 to 4, further including:

0.2 to 6 wt% of Bi.

Claim 6. A Pb-free solder according to one of the claims 1 to 4, further including:

0.5 to 3 wt% of In.

Claim 7. A Pb-free solder according to one of the claims 1 to 4, further including:

0.01 to 1 wt% of P.

As seen from above the document JP9-94688 has solder which includes Zn. On the other hand, in the applicants' invention, the solder includes 0.02 to 0.06 wt% of Ni. Thus, the solder of JP9-94688 is quite different in its inventive composition, as claimed in claims 1-6. Moreover, JP9-94688 discloses that the function of Ni is to miniaturize the crystals in the solder organization of a Sn-Ni alloy. However, it does not disclose the dissolution of Cu.

On the other hand, in the applicants' invention, the function of Ni is to suppress the Cu of circuit layers on Printed Wiring Boards (PWBs) in order to dissolve into the molten solder in soldering processes.

Thus, the solder of JP9-94688 is quite different in its function on Ni from the invention as claimed in claims 1-6.

U.S. Patent 6,139,979

Patent 6,139,979 has the following examples:

(a) A lead-free solder consisting essentially of:

0.01 to 0.5 wt% of Ni;

0.5 to 3.39 wt% of Ag; and

a balance of Sn.

(b) A lead-free solder consisting essentially of:

0.01 to 0.5 wt% of Ni;

0.5 to 2 wt% of Cu;

0.5 to 2 wt% of Ag; and

a balance of Sn.

(c) A lead-free solder consisting essentially of:

0.01 to 0.5 wt% of Ni;

0.5 to 2 wt% of Cu; and

a balance of Sn.

(d) A lead-free solder consisting essentially of:

0.01 to 0.5 wt% of Ni;

0.5 to 5 wt% of Sb; and

a balance of Sn.

As seen from above examples taken from Patent 6,139,979, only the solder (b) is the same in composition as the invention claimed in claims 1-6. Also, the ranges of Ni, Cu, and Ag are

overlapped with those of the invention claimed in claims 1-6.

However, Patent 6,139,979 does not disclose and does not teach the limitation that the Ni lowers a copper dissolution rate of the solder as expressed in applicants' claim 1.

Moreover, none of the examples in Patent 6,139,979 discloses the solder including 0.02 to 0.06 wt% of Ni.

Accordingly, the solder of Patent 6,139,979 is quite different from the invention as set forth in claims 1 to 6.

JP10034376

JP10034376 has the following claims:

Claim 1. A Pb-free Sn solder alloy containing:

0.1 to 10 wt% of Bi;

0.1 to 5 wt% of Ag;

0.05 to 2 wt% of Cu;

0.0005 to 0.1 wt% of Ni;

0.0005 to 0.01 wt% of P; and

a balance of Sn.

Claim 2. A Pb-free Sn solder alloy according to claim 1, further containing:

0.01 to 0.5 wt% of In.

The solder of JP10034376 includes Bi and P and thus, it is quite different in composition from the invention as claimed in claims 1-6.

Moreover, JP10034376 does not disclose and does not teach the limitation that the Ni lowers a copper dissolution rate of the solder as set forth in claim 1.

DE19816671

DE19816671 discloses Tin solder alloys as follows:

(a) A tin solder alloy containing

3.5 wt% or less of Sb;

3 wt% of Ag;

1 wt% or less of Ni; and

a balance of Sn.

(b) A tin solder alloy containing

3.5 wt% or less of Sb;

3 wt% of Ag;

1.0 wt% or less of P;

1.0 wt% or less of Ge; and

a balance of Sn.

(c) A tin solder alloy containing

4 wt% or less of Ag;

2 wt% or less of Cu;

1.0 wt% or less of Ni;

1.0 wt% or less of P; and

a balance of Sn.

(d) A tin solder alloy containing

4 wt% or less of Ag;

2 wt% or less of Cu;

1.0 wt% or less of Ni;

1.0 wt% or less of Ge; and

a balance of Sn.

(e) A tin solder alloy containing

4 wt% or less of Ag;

2 wt% or less of Cu;

1.0 wt% or less of Ni;

1 wt% or less of Ge; and

a balance of Sn.

The solder alloys of DE19816671 are quite different in composition from the invention as claimed in claims 1-6.

Moreover, DE19816671 does not disclose and does not teach the limitation that the NI lowers a copper dissolution rate of the solder as set forth in claim 1.

US Patent 4,643,875

Patent 4,543,875 has the following claims:

Claim 1. A ductile brazing alloy consisting essentially of:

35 to 95 wt% of Sn;

0.5 to 70 wt% of Ag;

0.5 to 20 wt% of Cu; and

0.1 to 4 wt% of Ti.

Claim 2. A ductile brazing alloy according to claim 1 having a composition of:

92 wt% of Sn;

5 wt% of Ag;

1.75 wt% of Cu; and

1.25 wt% of Ti.

Claim 3. A ductile brazing alloy according to claim 1 having a composition of:

85 wt% of Sn;

5 wt% of Ag;

9 wt% of Cu; and

1 wt% of Ti.

Claim 4. A ductile brazing alloy according to claim 1 having a composition of:

68 wt% of Sn;

15 wt% of Ag;

15 wt% of Cu; and

2 wt% of Ti.

Claim 5. A ductile brazing alloy according to claim 1 having a composition of:

59 wt% of Sn;

32 wt% of Ag;

7 wt% of Cu; and

2 wt% of Ti.

Claim 6. A ductile brazing alloy according to claim 1 having a composition of:

49 wt% of Sn;

40 wt% of Ag;

10 wt% of Cu; and

1 wt% of Ti.

Claim 7. A ductile brazing alloy consisting essentially of:

35 to 95 wt% of Sn;

0.5 to 70 wt% of Ag;

0.5 to 20 wt% of Cu; and

0.1 to 4 wt% of V.

Claim 8. A ductile brazing alloy consisting essentially of:

68 wt% of Sn;

14 wt% of Ag;

15 wt% of Cu;

1 wt% of Ni; and

2 wt% of Ti.

Claim 9. A ductile brazing alloy consisting essentially of:

68 wt% of Sn;

14.5 wt% of Ag;

15 wt% of Cu;

0.5 wt% of Cr; and

2 wt% of Ti.

None of the alloys of cliams 1 to 7 and 9 or of Patent 4,643,875 includes Ni. Thus, the composition of the solder of 4,643,875 is quite different from that of the invention, as claimed in claims 1-6.

Also, the alloy of the claim 8 of US Patent 4,643,875 includes Ti. The ranges of Cu, Ag, and Ni do not overlap the ranges of the inventive composition as claimed in claims1-6.

Moreover, US Patent 4,643,875 does not diclsose and does not teach the limitation that the Ni serves to lower a copper dissolution rate of the solder of claim 1 of the invention.

Additionally, the alloys of US Patent 4,643,875 are not solder alloys, but are ductile brazing alloys.

35 USC 103 Rejection of Claims 1-14

The invention as claimed in claims 1 to 14 is different from the teachings of the references cited by the Examiner in the following way.

WO9834755

WO9834755 discloses Sn-Ag-Cu eutectic alloys containing:

3.5 to 7.7 wt% of Ag;

1.0 to 4.0 wt% of Cu; and

a balance of Sn.

The alloys may be modified with Ni and/or Fe.

As seen from above, if Ni is added for modification, the alloy of WO9834755 is the same composition as the invention claimed in claims 1-14. Also, the ranges of Ni, Cu, and Ag are overlapped with those of the invention as claimed in claims 1-14.

However, WO9834755 does not disclose and does not teach the limitation that the Ni lowers a copper dissolution rate of the solder of claim 1 of the invention.

Accordingly, the allys of WO9834755 are quite different from the invention as claimed in claimed in claims 1to 14.

As seen from the above description, the references cited by the Examiner do not disclose or teach the limitation that the Ni serves to lower a copper dissolution rate of the solder.

The Examiner states in the Office Action that this limitation is inherently possessed by the teachings of the cited references. Therefore, he argues that the invention as claimed in claims 1-14 are obvious over the references cited.

However, the claimed limitation is not a "property" of a material but a characteristic of Ni which suppress the dissolution of Cu, a characteristic which the inventors discovered. On the basis of this discovery, the invention was designed to overcome the problems and to provide a

Pb-free solder that has a satisfactory low melting point, that effectively suppresses the "copper leaching" phenomenon, that is difficult to be oxidized and that has a high wettability.

Moreover, as seen from the claim 1, the range of Ni that provides this characteristic is limited within an extremely narrow range of 0.02 to 0.06 wt%. Such a narrow limitation has been quite difficult to discover. In other words, according to the invention, the lead-free solder is not obvious from the cited references.

For the foregoing reasons, it is thought that the application is now in condition for allowance. However, if the Examiner should disagree, he is respectfully requested to telephone the undersigned attorney before issuing a new Office Action. Any reasonably necessary amendments will be made promptly.

Reconsideration and allowance are requested.

Respectfully submitted,

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J. Warren Whitesel
Registration No. 16830
MICHAEL BEST & FRIEDRICH LLC
ATTORNEYS AT LAW
401 North Michigan Avenue
Chicago, Illinois 60611
Telephone 312-661-2100
Fax 312-661-0029

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